

BECOM



BNE

A word cloud centered around the phrase 'believe science hands-on equipment'. The words are arranged in a circular pattern, with 'believe science' on the left and 'hands-on equipment' on the right. The words are in various colors (dark green, brown, yellow, and light green) and sizes, indicating their relative frequency or importance. The background is white.

believe science hands-on equipment

discovery curriculum progress

exploring engaging personal real world students not-boring connected outside life

relate work experimenting fun experience connections

questioning

BW

A word cloud featuring the words 'science' and 'believe' in large, dark red, serif fonts. Surrounding these central words are various other terms in different sizes and colors (including shades of red, orange, and yellow). The words are arranged in a circular pattern around the center. The words include: 'science', 'believe', 'real', 'world', 'knowledge', 'change', 'process', 'trial', 'perspective', 'love', 'appreciating', 'demonstrations', 'non-threatening', 'questioning', 'sense', 'wonder', 'constant', 'error', 'connected', 'relating', 'global', 'interactive', 'connection', 'hands-on', 'life', 'foster', 'cross-curricular', 'observations', 'inquiry', and 'know'.

science
believe
real
world
knowledge
change
process
trial
perspective
love
appreciating
demonstrations
non-threatening
questioning
sense
wonder
constant
error
connected
relating
global
interactive
connection
hands-on
life
foster
cross-curricular
observations
inquiry
know

MBC



ME

hands-on
science
believe
interactive
activity
curiosity
questions
world
real
messy
explain
specialized
apply
relevant
ask
proper
support
exciting
meaningful
life
inspire
equipment
inquisitive
related
curriculum
instill
loud fun
embraces
effectively
risks

MN

A word cloud featuring various terms related to science education. The words are arranged in a circular pattern, with some larger and more prominent than others. The colors of the words range from dark red to orange. The words include:

- believe
- science
- hands-on
- inquiry
- world
- fun
- discovery
- investigation
- make
- interactive
- exploring
- cross-curricular
- engaging
- practical
- involve
- self-discovery
- age
- connections
- text
- appropriate
- meaningful
- journey
- user-friendly
- real
- based
- memorable
- interesting
- related
- relevant
- applied

MS

science
believe
learning
connections
real world
hands-on
interactive
exploration
relevant
fun
current
theory
inquiry-based
peak
student's
experiential
age
inspiring
curiosity
grade
connected
investigating



God of Love,
Bless our time here together today,
United in our mission,
We will work in your service,
Transcending the distractions and stresses
that sometimes impair our vision,
And calling forth the giftedness in one another
by listening with generous hearts and receptive minds,
and by offering our “best selves” to the process
we undertake here today.



Grace us, we pray,
With a new sense of mystery,
A new experience of your presence,
A new commitment to your Gospel,
A new dedication to your dream for humanity.



Snowball Introductions



My earliest memory of grade 9 ...



Agenda for the day

- MINDS ON

- Welcome and Prayer
- What's the Big Idea?
- Inquiry Question
- Activating Prior knowledge
 - Is this Inquiry? Graffiti activity
- What is Inquiry?



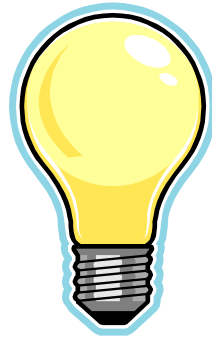
- ACTION

- Exploring Inquiry-based Learning in Science
- The Smarter Science Framework

- CONSOLIDATION

- The Smarter Science Framework: interconnected Literacy, Numeracy, and Science
- Planning Time
- Revisiting “What is Inquiry?”
- Exit Card

The Big Idea



Inquiry Based Learning

***“Tell me and I forget,
Show me and I remember,
Involve me and I understand”***



Our Inquiry Question:

What can inquiry-based learning
look like in science?



Is this Inquiry?

Graffiti Activity



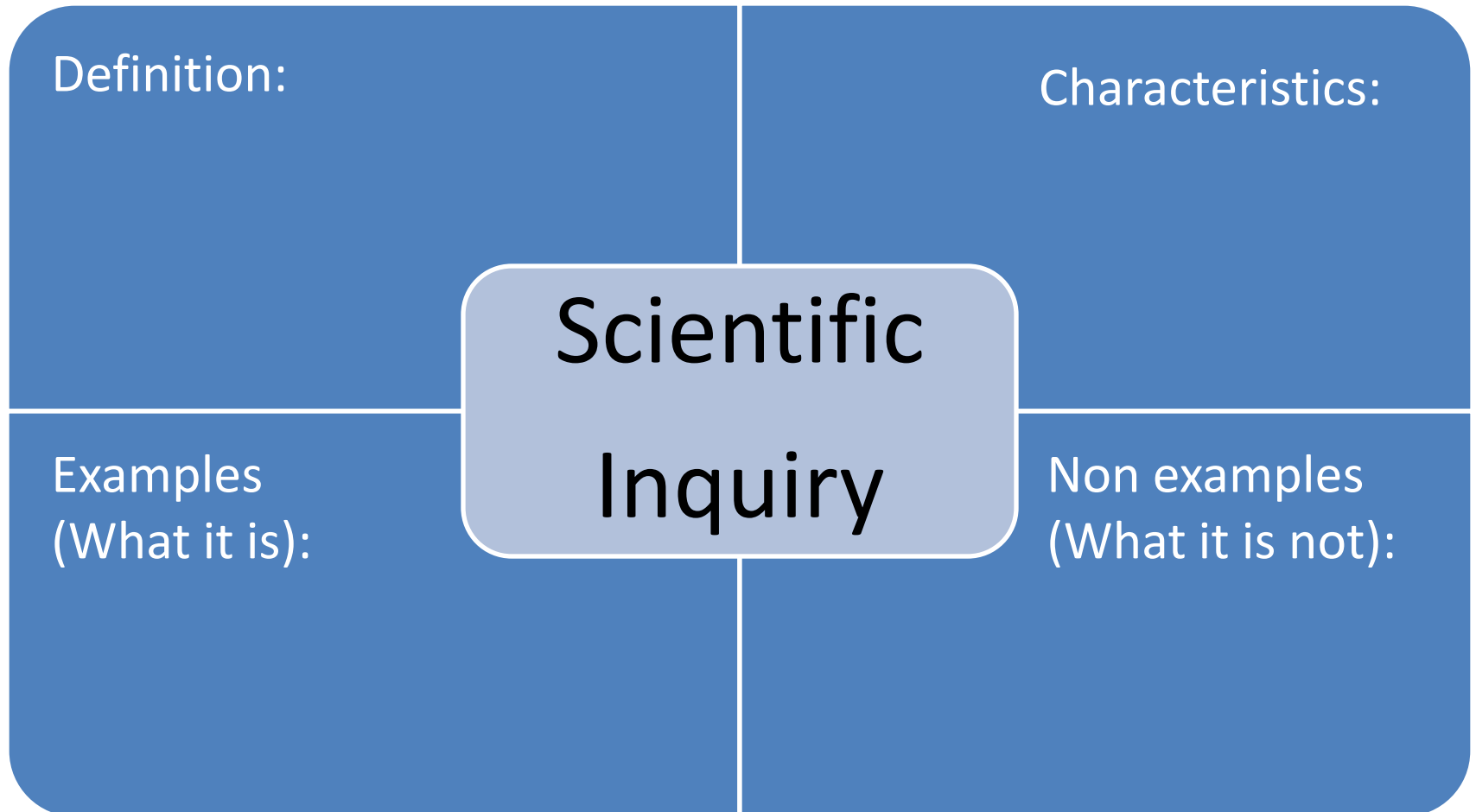
- Visit each of the 6 charts posted.
- Read and discuss the student sample or teacher assignment provided.
- Discuss whether this sample/assignment is “inquiry based” / an example of “inquiry”.
- Record your group’s thoughts and ideas on the chart paper. Respond to or add onto other groups’ ideas.



What is Inquiry?



Frayer Model





4 categories of inquiry



- Demo
- Activity
- Teacher-initiated
- Student-initiated

The Inquiry Grid

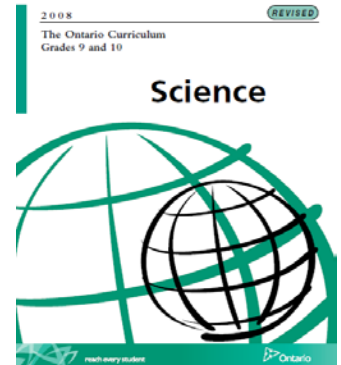
Llewellyn, D. *Teaching High School Science Through Inquiry* pp. 66-76

Llewellyn, D. *Inquire Within* pp. 64-77

	Demonstration	Activity or “cookbook lab”	Teacher- Initiated Inquiry	Student- Initiated Inquiry
Posing the Question	teacher	teacher	teacher	student
Planning the Procedure	teacher	teacher	student	student
Formulating the Results	teacher	student	student	student
Role of Teacher	controller	provides direction	guide/facilitator	facilitator
Role of Student	observer	follows direction	problem-solver	investigator
Materials	provided	provided	suggested	suggested
Content	focused	focused	needs some focusing	requires focusing



Curriculum connections to Inquiry

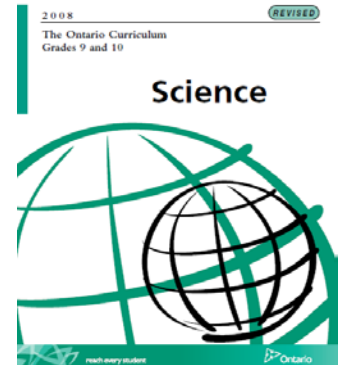


The Goals of the Science (and Technology) Program

- 1. To relate science and technology to society and the environment
- 2. to develop the skills, strategies, and habits of mind required for scientific inquiry/investigation (and technological problem solving)
- 3. to understand the basic concepts of science (and technology)



Curriculum connections to Inquiry

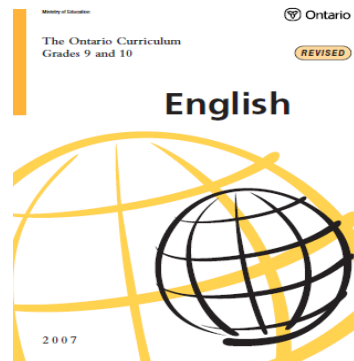
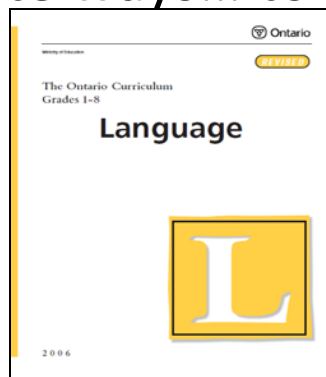


“An inquiry approach, with emphasis on learning through concrete, hands-on experiences, best enables students to develop the conceptual foundation they need.”

- Pg. 29 Science, Gr. 1-8
- Pg. 30 Science, Gr. 9-10
- Pg. 32, Science, Gr. 11-12

Curriculum connections to Inquiry

- “Inquiry is at the heart of learning in all subject areas. Students are encouraged to develop their ability to ask questions and to explore a variety of possible answers to those questions. They acquire the skills to locate relevant information from a variety of sources, such as books, newspapers, dictionaries, encyclopaedias, interviews, videos, and the Internet. The questioning they practised in the early grades becomes more sophisticated as they learn that all sources of information have a particular point of view and that the recipient of the information has a responsibility to evaluate it, determine its validity and relevance, and use it in appropriate ways... to become an independent, lifelong learner.

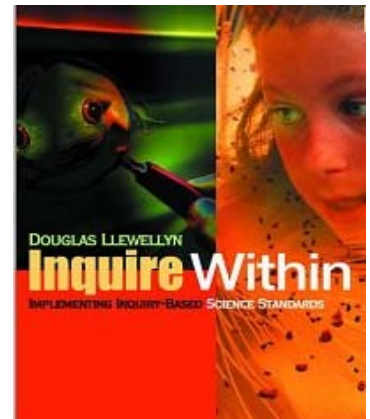


- Language, Gr. 1 – 8 , pg. 29
- English, Gr. 9 – 10, pg. 34



Resource support for Inquiry

- Pearson “*Investigating Science and Technology*,” Gr. 7 & 8 Teacher’s Resource, Program Overview, pg. PO-42, PO-41
- Llewellyn, “Inquire Within”, (gr. 7 & 8)
- Llewellyn, “Teaching High School Science through Inquiry” (gr. 9 – 10)





Learning Goals

By the end of this session you will:

- be able to demonstrate an understanding of what inquiry based learning looks like in a science class
- become familiar with the Smarter Science framework
- plan for inquiry in your classroom



Imagine...

Children would:

- read about hockey techniques
- hear stories about hockey greats, and hockey sweaters
- watch the teacher/coach demonstrate how to play, and
- write paper & pencil tests to see if they know how to play

As undergraduates they might be allowed:

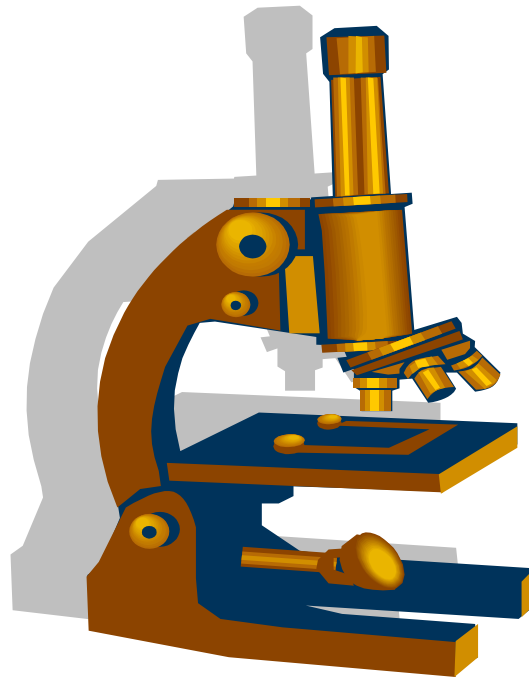
- Under strict supervision, to reproduce famous historic hockey plays

But only in graduate school would they, at last, actually get to play a game!



Action

- Preparing a wet mount



dpacsb-ssc - Smarter Science - Windows Internet Explorer


http://dpacsb-ssc.wikispaces.com/Smarter+Science

Google

File Edit View Favorites Tools Help

dpacsb-ssc - Smarter Science

guest · Join · Help · Sign In · wikispaces

 dpacsb-ssc

Smarter Science

page discussion history notify me

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Assessment and Evaluation

Biology

Chemistry

Credit Recovery Profiles

Differentiated Instruction

Earth and Space Science

Environmental Science

Gizmos

Grade 10 Science

Grade 9 Science

Other

Pasco

Physics

Riverwood

Safety

Science

Science Fair

Science Writing Teams

Smarter Science


Specialist High Skills Major


Welcome to the Smarter Science page for DPACSB teachers!


Smarter Science Website: www.smarterscience.ca

PowerPoint from Nov/Dec Session:


Poster Handouts:

 [\(Set 1\) Begin to Emerg Complete DRAFT May 5 2010.pdf](#)

 [\(Set 2\) Explore to Competent Complete DRAFT May 5 2010.pdf](#)


 [\(Set 3\) Initiate and Plan Emerg to Proficient April 28 2010.pdf](#)

How-To-Use Steps for Inquiry Posters:


 [How to Use Steps to Inquiry Posters.doc](#)


Procedure Card Cut-Outs:

Preparing a wet mount

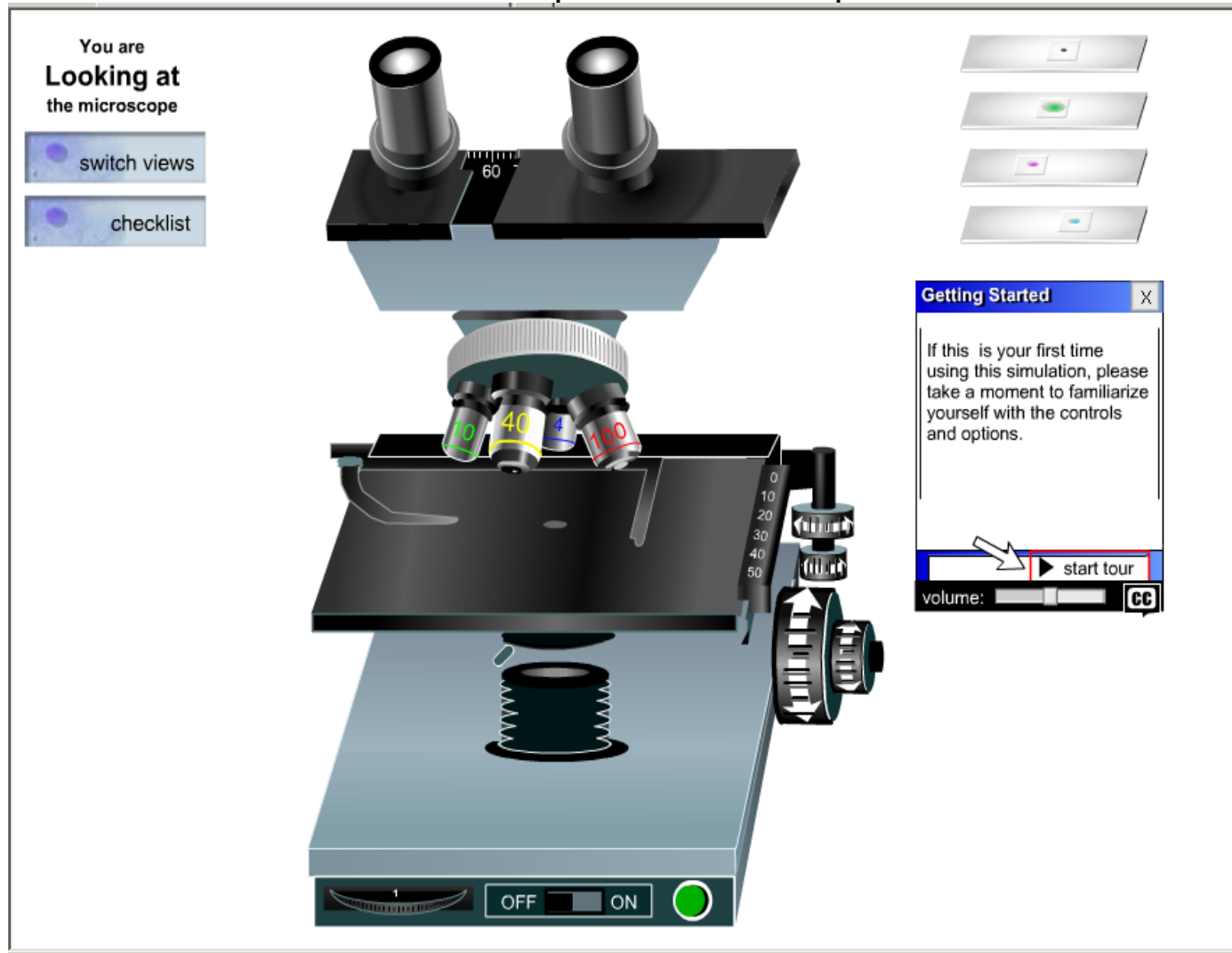
 [Procedure Cards - Preparing a Wet Mount.docx](#)

Penny & Water

 [Procedure Step Cards \(Penny & Water\).doc](#)

 [Procedure Step Cards \(Penny & Water\) with pictures.doc](#)

Preparing a Wet Mount cont. Virtual Compound Microscope



Virtual Compound Microscope - Windows Internet Explorer

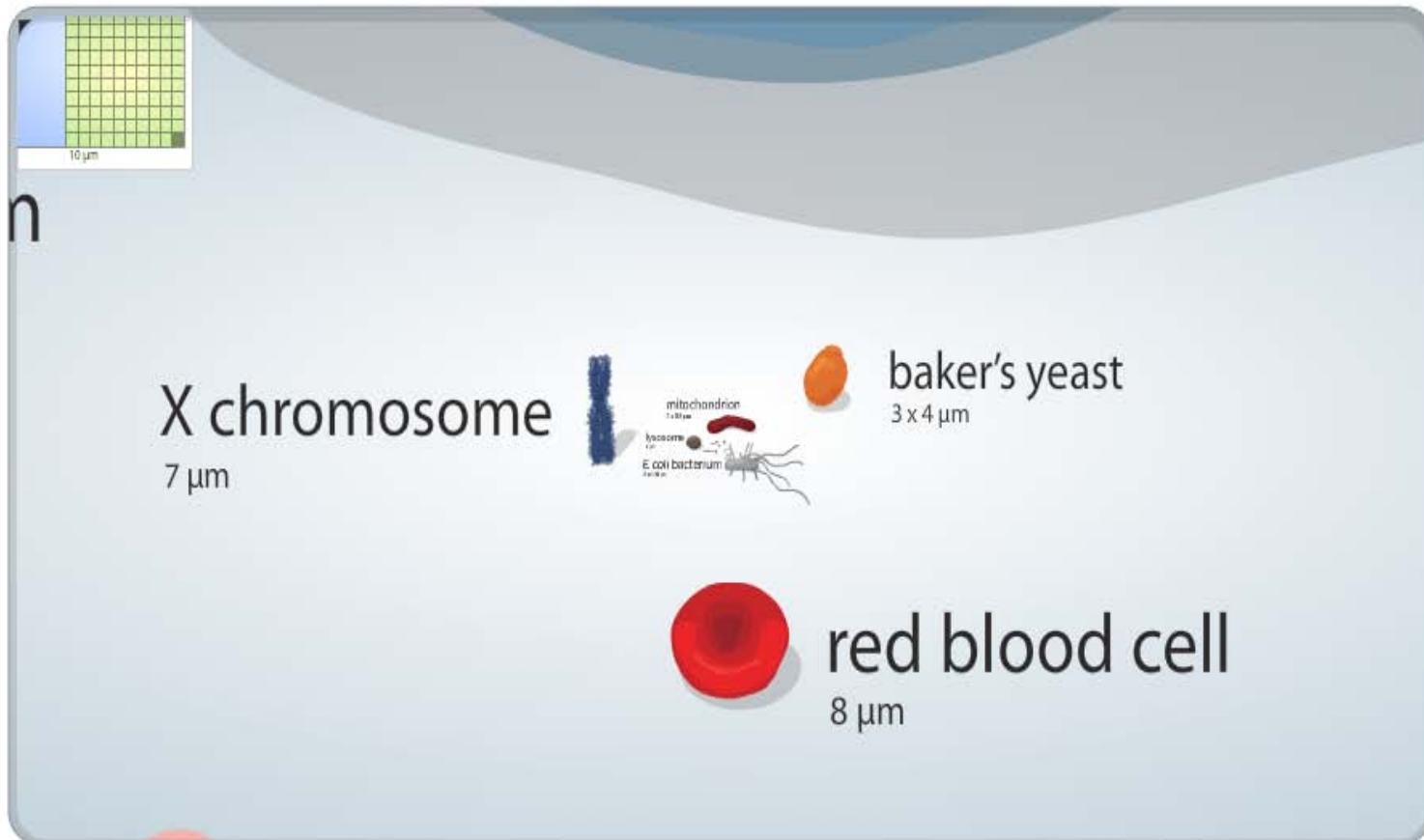


<http://www.udel.edu/biology/ketcham/microscope/scope.html>



<http://learn.genetics.utah.edu/content/begin/cells/scale/>

CELL SIZE AND SCALE



New Approaches to Traditional Labs

- Revise the:
 - Question Section
 - Materials Section
 - Procedure Section
- Take Away the Data Table or Chart
- Do the Lab First



Llewellyn,
Teaching High School Science Through Inquiry, pg. 91-95
Inquire Within, pg. 76 - 78



Adapted from research by Troubridge, Ryboe and Powell 2000

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**How many drops of water
can fit on a penny?**





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SEARCH

What is Smarter Science?



Smarter Science is an open-source, engaging framework for teaching and learning science in grades 1-12 and for developing the skills of inquiry, creativity and innovation in a meaningful and engaging manner.

Resources to work fast



If you are looking for lesson plans, ideas for modifying your present lessons or links to inquiry-based resources, browse the menu or use the 'search' box (upper right)

Purchasing Smarter Science materials



Purchase posters and materials we use for teaching and demonstrations. We make it a point to use inexpensive materials and our posters are available for purchase on a cost-recovery basis. [Click here](#)

Smarter Science to Kick Off Science Fair Campaign



November 16, 2010 | [SHARE](#)

Smarter Science is on the move! Today we will be in North Bay, at Nipissing University, to kick off a campaign to get more students involved in science fairs. Watch the keynote live at: mms://streamer.nipissingu.ca/invent at 7pm.

Mike Newnham, Program Director of Smarter Science, will be giving a keynote speech called "Invent the..."

Tags: [Story](#)

Blog Posts

SCCAO

November 10, 2010 by newnham

Assessment and Evaluation with Damian Cooper was the topic of the day at the SCCAO (Science Coordinators and Consultants Association of Ontario)...

Eureka! Hands-on Minds-on Science -Current Electricity -- The Electrical Circuit

Professional Development

Declining Interest Sparks Analysis

November 3, 2010 by newnham

from the North Bay Nugget Organizers for the North Bay Regional Science Fair are planting seeds for renewed interest in the annual spring contest...

Inquiry By The Bay-Reflections

October 22, 2010 by newnham

User login

Username or e-mail: *

Password: *

Log in

- [Log in using OpenID](#)
- [Request new password](#)

Sponsors





Lunch Prayer

May the blessing of the five loaves and the two fishes,
which God shared out among the five thousand, be ours.

In a world where so many are hungry,
May we eat this food with humble hearts;
In a world where so many are lonely,
May we share friendship with joyful hearts.

Thanks to you O Lord,
for the abundance of food,
For the bounty of creation, for all that is good.

Through Christ our Lord we pray.
Amen.



What's in the Bin?

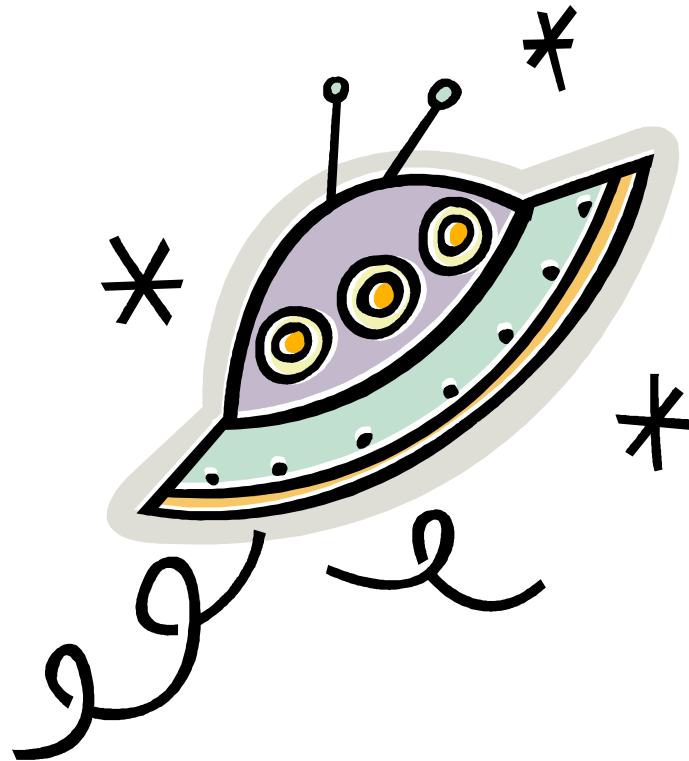


Assessing Inquiry-based Learning

- Rubric & Self-Assessment Checklist for Inquiry Investigation – see Damian Cooper’s “Talk About Assessment”

Post Lunch Fun

Human Circuit with UFO Ball



Teacher's Sharing Comments on Smarter Science





Consolidation

Card Sorter Activity

- Sort cards in envelope into 3 groupings:
 - Numeracy skills
 - Literacy skills
 - Both numeracy & Literacy skills





Predicting, Inferring and Hypothesizing Oh my!



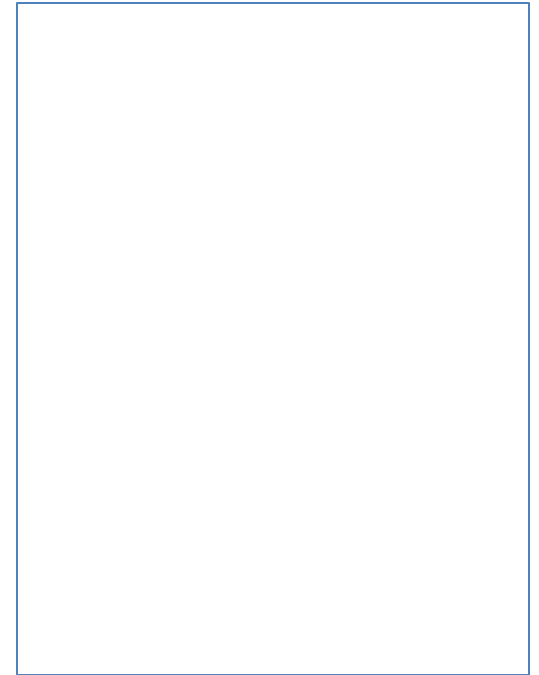
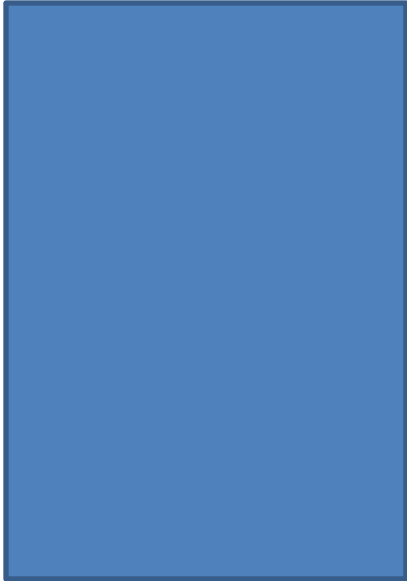
What 's the difference?

(insert comic)



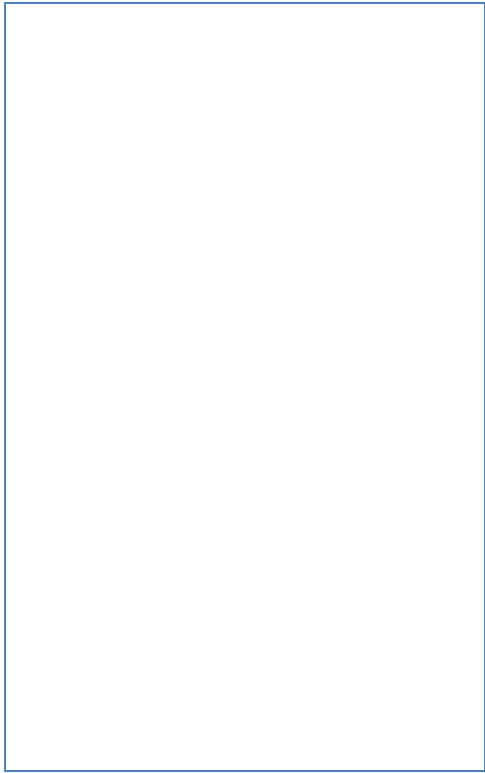
Predict what will happen next...

(insert comic)

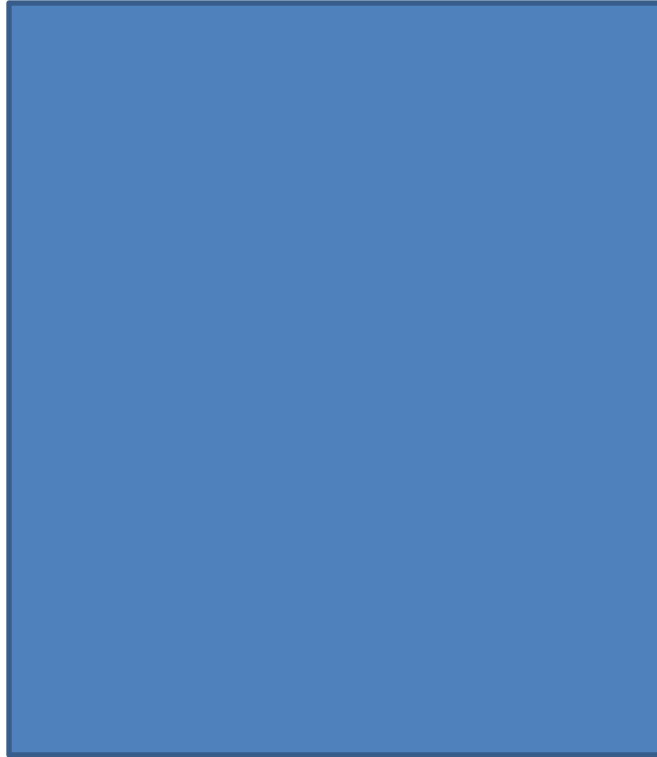


Infer why this is so...

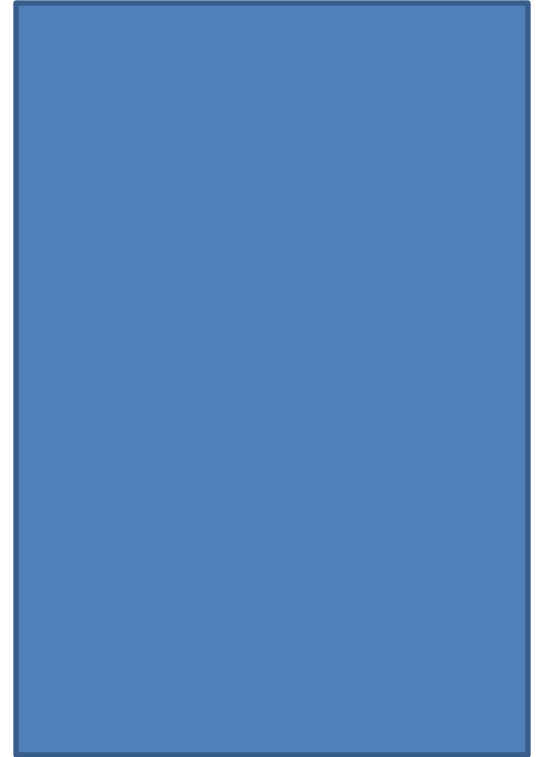
(insert comic)



If...



then...

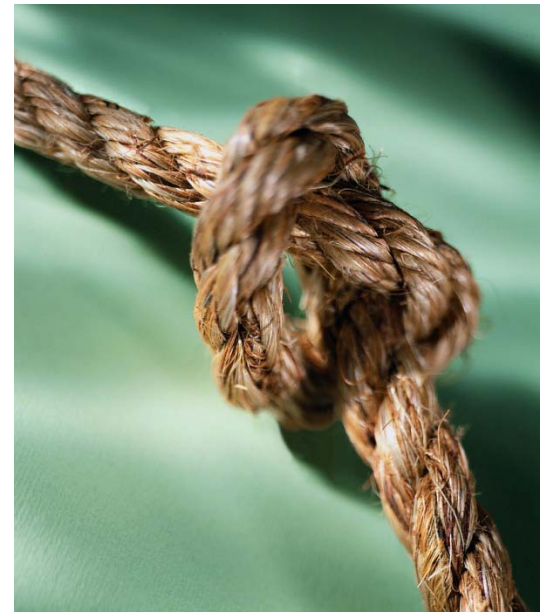


investigate...

Predict, Infer, Hypothesize...



Sandra's Demo



Consolidation: Planning Time





+



=

?

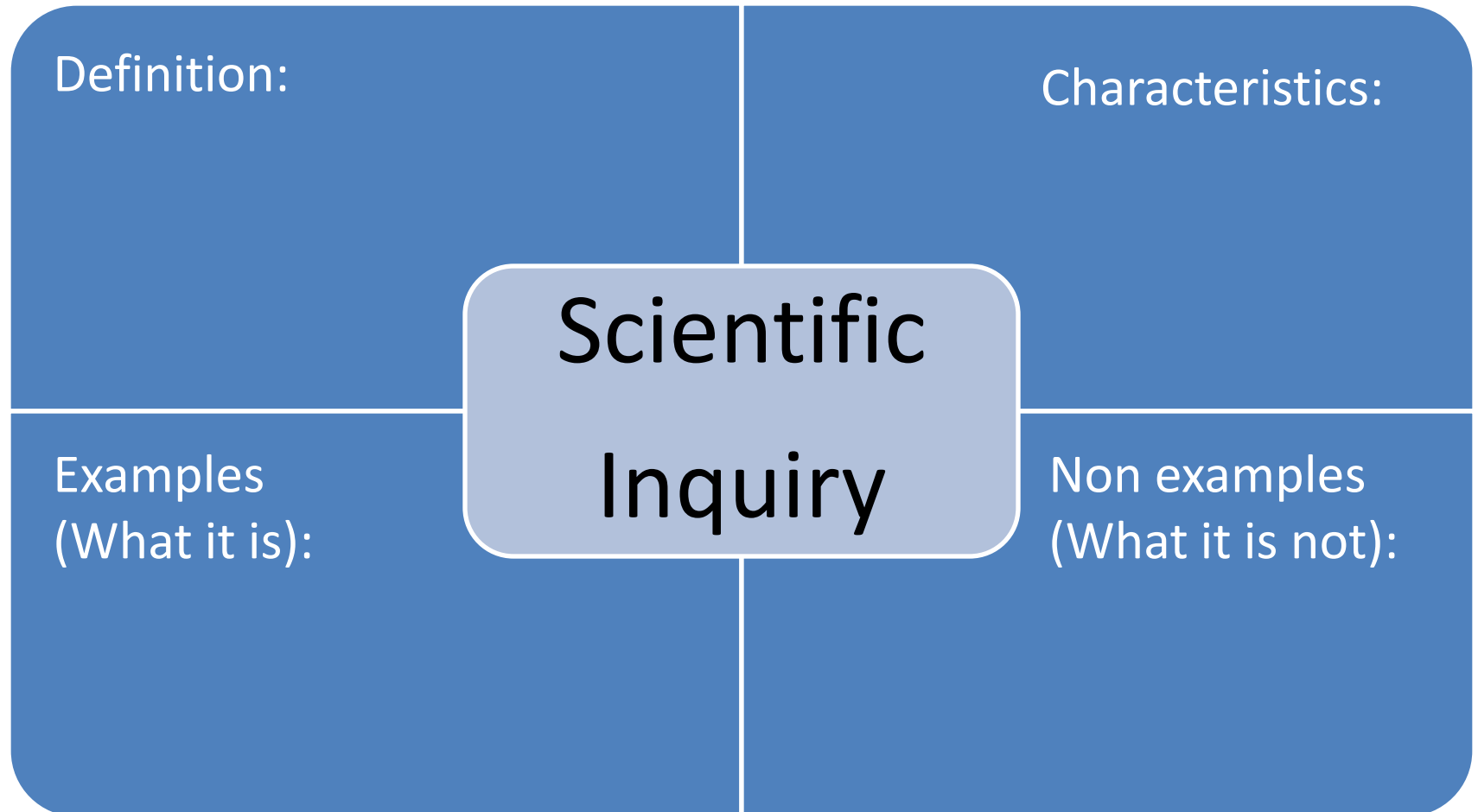
P.E.O.E.
Predict – Explain – Observe – Explain



What is Inquiry?



The Frayer Model Revisited



Definitions of Inquiry

- Inquiry involves making observations; posing questions; examining books and other sources of information to see what is already known in light of experimental evidence; using tools to gather, analyze and interpret data; proposing answers, explanations, and predictions; and communicating the results. Inquiry requires identification of assumptions, use of critical and logical thinking, and consideration of alternative explanations.
- Inquiry is the scientific process of active exploration by which we use critical, logical, and creative thinking skills to raise and engage in questions of personal interest. Driven by students' curiosity and wonder about observed phenomena, inquiry investigations usually involve:
 - Generating a question or problem to be solved
 - Brainstorming possible solutions to the problem
 - Stating a hypothesis to test
 - Choosing a course of action and carrying out the procedures of the investigation
 - Gathering and recording the data through observation and instrumentation to draw appropriate conclusions
 - Communicating findings

– National Research Council

– Llewellyn, pg. 24
– Llewellyn, Inquiry Within, pg. 16



- Smarter Science builds skills for open inquiry
- Naturally leads to projects that could entered in Science Fairs
- Peel Region Science Fair: tentatively Sat April 9 & Sun April 10
 - For more info, contact Tony, he's a co-chair for the PRSF Committee
- CWSF May 14 – 21 in Toronto



Next Steps



- Plan an inquiry experience for your students. Be prepared to share this experience and/or a sample of student work at our next session
- Grade 7 and 8s, please sign up on the training site for the upcoming January session on the STSEs by Friday, January 7th
- More information to follow for the Grade 9 and 10 teachers (sharing & consolidation)

Closing Reflection

It helps now and then, to step back and take a long view. We accomplish in our lifetime only a fraction of the magnificent enterprise that is God's work. Nothing we do is complete, which is a way of saying that the kingdom always lies beyond us. We lay foundations that will need further development.

We cannot do everything, and there is a sense of liberation in realizing that. This enables us to do something, and to do it very well. It may be incomplete, but it is a beginning, a set along the way, an opportunity for the Lord's grace to enter and do the rest.

- From Oscar Romero

Today's "Exit Card"



Smarter Science

THANK YOU

**Pick up a set of posters when you
hand in your exit card!**